Data indicates shortage of engineers is imminent

Engineers create everything we see or use in our everyday lives, from the alarm clock that woke you up today and your child's lunch box to your car and the roads you drive on. However, these everyday conveniences, and necessities, could be in jeopardy if the current decrease in engineering graduates continues.

According to Dr. Bonnie Dunbar, NASA astronaut and Assistant Director for University Research and Affairs, the National Science Foundation has reported that during the past 13 years, the number of U.S. aerospace and electrical engineering graduates has decreased approximately 50 percent. Compounded by the fact that the surge in high-tech industries has increased demand for engineers, the U.S. is facing a critical shortage of skilled engineering professionals that is currently being met by increasing the number of foreign engineers and scientists brought into the U.S. through the H1B visa process.

The engineering shortage, even in its early stages, is already evidenced in the space program. Although JSC remains an employer of choice among many engineering graduates, according to Dunbar, the national shortage has already impacted such programs as ISS software development.

> ***The future of human exploration and our nation's leadership of that exploration will depend upon ensuring that the engineering pipeline is full.***
>
> –Bonnie J. Dunbar, Ph.D.

"The aerospace industry is particularly hard-pressed because it is competing with other high-tech sectors which can pay higher starting salaries," said Dunbar. "It is difficult for a federal agency to compete in that arena."

Despite the growing demand for engineers and graduates with technical degrees, the National Academy of Engineers reports a downward trend in students pursuing engineering degrees.

Dr. Dunbar says preparation for an engineering course of study begins at the middle school and high school levels. Without the appropriate math and science classes in high school, some students can find themselves behind before they've even started their freshman year of college.

"We are not preparing our youth with the skills they need to be able to study engineering," said Dunbar. "By the time they are out of high school they need to have taken physics, biology, chemistry, and the math curriculum through calculus. Engineering deans have reported to me that increasingly more students entering engineering colleges must attend remedial classes just to begin their freshman year."

Former Center Director Aaron Cohen, now professor emeritus at Texas A&M University's College of Engineering, says that Texas A&M University is an exception and has not experienced a decline in high school applicants, but he has noticed a decrease in students pursuing graduate degrees.

"A&M is the largest engineering school in the country and our enrollment has not indicated a change," said Cohen. "But we have fewer graduates pursuing graduate degrees. It seems more are leaving academia after receiving their bachelor's degrees for lucrative jobs in the marketplace." Current national indicators show that graduate engineering student enrollment is declining, with nearly one-half of those in master's and doctoral programs from countries other than the U.S.

Cohen says more research dollars are needed to help stimulate college engineering programs and entice students to further their education.

"At this time, aerospace colleges do not get a lot of support from industry," said Cohen. "Putting more research dollars into the colleges, specifically into aerospace majors, is needed. That is the track to take to induce more students to study engineering."

The shortage will take the efforts of many to reverse.

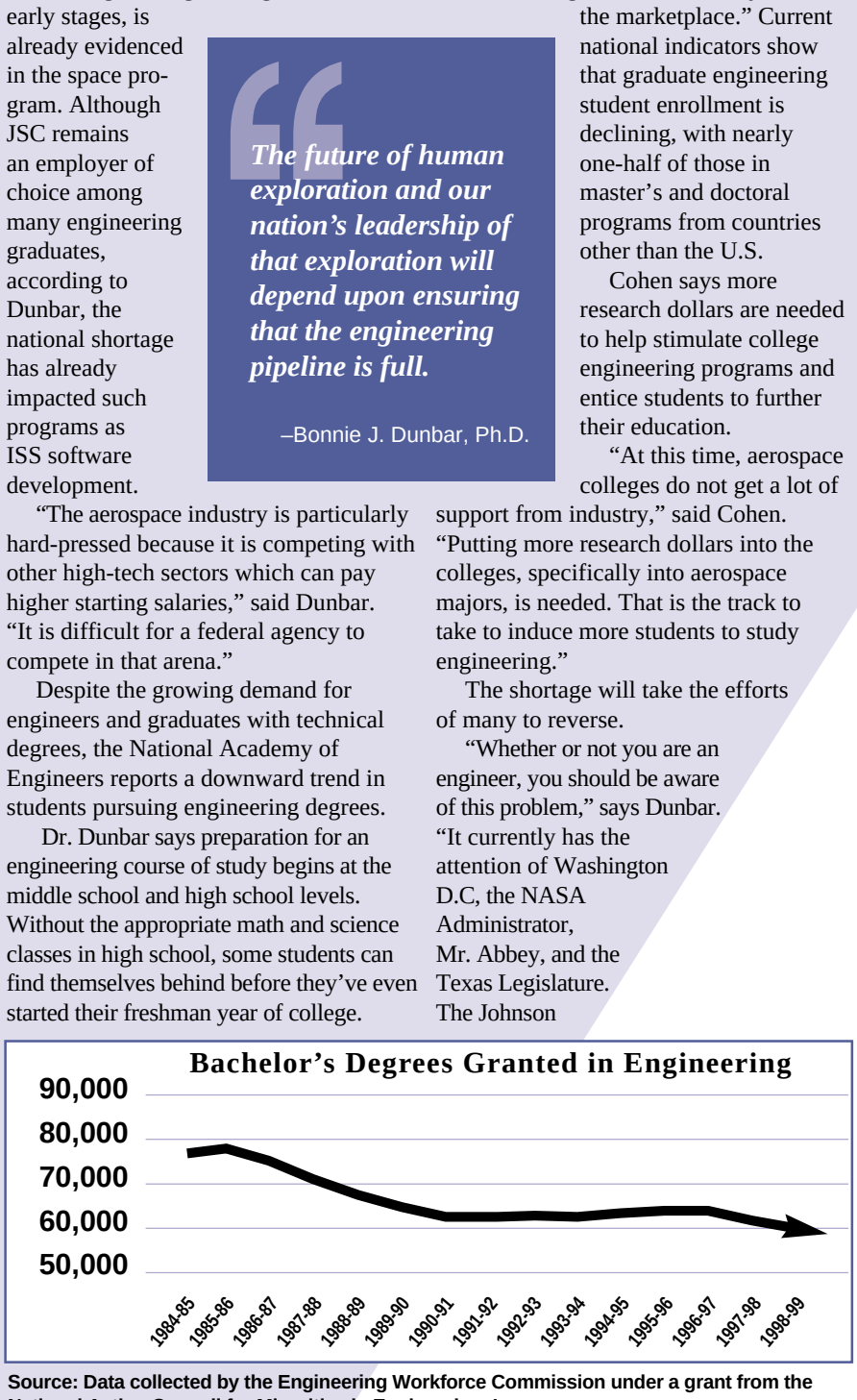
"Whether or not you are an engineer, you should be aware of this problem," says Dunbar. "It currently has the attention of Washington D.C, the NASA Administrator, Mr. Abbey, and the Texas Legislature. The Johnson Space Center and its contractors hire more engineers than any other technical job classification."

Cohen feels all engineers need to actively communicate the excitement of the profession with students.

"Engineering is the basis for economic development of our country–be it automotive, architectural, etc.," said Cohen. "And the work is fantastic."

Photo courtesy of Texas A&M University

Texas A&M University is one of the few not experiencing a decrease in engineering enrollments. Shown here, A&M aerospace students prepare an airplane model for wind tunnel testing.



Source: Data collected by the Engineering Workforce Commission under a grant from the National Action Council for Minorities in Engineering, Inc.

What can you do?

Bonnie J. Dunbar, Ph.D., NASA astronaut and member of the National Engineering Week Advisory Committee/NSF Engineering Advisory Panel, offers the following suggestions to help bolster student interest in engineering:

1) Remind friends, acquaintances and student audiences that without engineers, there is no NASA, no cell phones, no medical equipment, no airplanes, no Playstation©, etc.
2) Educate students, their parents, teachers, and counselors on the algebra, biology, chemistry, or physics courses required to pursue engineering degrees.
3) Share information about NASA's numerous educational programs, workshops and student programs. The JSC Home Page describes most: http://www.jsc.nasa.gov/pao/educators/.
4) Ensure that your alma maters and other universities have information about new research funds, such as the new University Initiative starting in FY02 that will help expand graduate programs, faculty and research. Information is available at http://www.hq.nasa.gov/office/codea/codeac/WWW/.

How JSC is tackling decline in engineering

Since 1987, the number of students pursuing degrees in engineering has steadily declined. At this rate, some forecasters predict the trend will result in a critical shortage of engineers within the next five years.

According to Mike Kincaid, branch chief, Education and Student Programs Branch, as NASA represents one of the more glamorous realms of engineering, it is fortunate to be able to attract great employees for its job openings. However, to increase the number of engineers, our employees are obliged to share our stories, projects and excitement with students, peers and teachers.

"It's appropriate for us to use space and the excitement of space exploration to encourage students to study math and science," said Center Director George Abbey. "By sharing the experiences of the human space programs with them, we can show them the rewards of becoming engineers."

During the past decade, JSC has created several programs to expose more of our area youth to the exciting and challenging work engineers do and to generate interest in pursuing engineering careers of their own.

"We're not doing these just so that students can have a good time," said Kincaid. "We do it to attract them to careers in engineering and science."

Despite the fact that JSC employs more than 15,000 individuals either as civil servants or contractors, we always need more volunteers for our outreach opportunities.

"All of these programs require engineers in the JSC workforce to dedicate a few hours to make the program successful," said Kincaid. "Without their help, the programs will ultimately fail, and the profession will suffer."

There are many ways that JSC employees and contractors can give back to the community and help perpetuate the interest in engineering, math and science needed to sustain our space program and economy at large.

Right now, organizers are still seeking volunteers to help accommodate the stream of requests from schools, teachers and student organizations for National Engineers Week.

Now in its 50th year, E-Week is a nationwide program committed to increasing awareness and generating interest in engineering among our country's youth. February 18-24, engineering professionals from a wide range of industries will visit their local schools and community centers to provide guest presentations, hands-on activities and answer questions from students.

JSC employees still have a chance to participate in E-Week activities. Although E-Week officially runs for only seven days, in practice, JSC sponsors special engineering outreach projects for the entire month of February. As part of E-Week, JSC volunteers will visit area schools to make science, engineering and space-related presentations. New this year, JSC will also provide six Web cast events and participate in Space Center Houston's Home School Day.

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Bill Shepherd, Expedition 1 commander, discusses math theories used in everyday life with Galena Park High School students during Engineering Week presentations.

For more information on how you can participate in E-Week, visit JSC's internal E-Week Web site at http://www4.jsc.nasa.gov/scripts/eweek/index.cfm.

E-Week is just one of several student outreach programs JSC participates in. JSC also sponsors the Texas Aerospace Scholars, a yearlong, interactive, online learning process highlighted by a weeklong internship at JSC; the Summer High School Apprentice Research Program, in which students work at JSC for eight weeks during the summer with a NASA mentor in a lab or office environment; and the Mars Settlement Design Competition, a

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